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10/593,281	09/18/2006	Masaaki Kuranuki	043888-0518	7824

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EXAMINER	
OMAR, AHMED H	

ART UNIT	PAPER NUMBER
2858	

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06/24/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/593,281	KURANUKI ET AL.	
	Examiner	Art Unit	
	AHMED OMAR	2858	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 6-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3 and 6-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *09/18/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 1-3 and 10-13** are rejected under 35 U.S.C. 102(b) as being anticipated by Asao et al. (US 6,377,030 B1).

As per claim 1, Asao et al. discloses A power system comprising: an electrochemical device (See Fig.5, Item#210, discloses a secondary battery); a load device (See Fig.5, Item#207); a power generator (See Fig.5, Item#200, discloses a D.C. power source); and a charge/discharge controller of said electrochemical device (See Fig.5, Item#208, discloses a control circuit with arithmetic operation unit),

said electrochemical device comprising a positive electrode, a negative electrode, and a liquid electrolyte or a solid electrolyte (See Fig.5, Item#210 and Col.3, lines 4-6),

said electrochemical device having a charge/discharge curve that has at least one step, a given step of said at least one step having an inflection point (See Fig.1, discloses the charge/discharge curve with 2 inflection points, also see Fig.2A charge/discharge operation curve), a voltage corresponding to the inflection point or a point adjacent to the inflection point being set as a threshold value , the inflection point existing greater than 0% and less than 100% of a remaining capacity (See Col.3, lines 4-21 and Col.6, lines 24-29 disclose the secondary

battery is charged with variation in voltage/current and that it is preferable to make the charging current/voltage vary in response to a reference signal at the inflection point i.e. the voltage at the inflection point is the threshold, the applicant also states that any point adjacent to the inflection point maybe set as the threshold value, therefore any chosen threshold point will satisfy the limitation)

said charge/discharge controller being configured to control charge/discharge of said electrochemical device (See Fig.5, Item# 208 , Col.7, lines 45-64 and Fig.1, disclose the battery is charged by changing current/voltage at least until it reaches the storage quantity at the inflection point [q1]which corresponds to threshold voltage [v1]), and

said power system further comprises a comparator that compares the voltage of said electrochemical device with said threshold value (See Fig.21, Items#702 and 713, disclose a cell voltage detector which detects the battery voltage and transmit that value to the controller, the controller then compares this detected value to the stored threshold values) ,

wherein based on an output of said comparator, said charge/discharge controller causes said electrochemical device to be charged when the voltage is lower than said threshold value and causes said electrochemical device to be discharged when the voltage is higher than said threshold value (See Fig.21, Items#713 and 704 and Col.21, lines 7-59 , disclose a controller and charge/discharge selector such that when the battery detected voltage exceeds the threshold, the battery is discharged and when the detected voltage is less than the threshold, the battery is charged).

As per claim 2, Asao discloses the power system in claim 1, wherein when the voltage equals to the threshold value, said charge/discharge controller selects charging if the electrochemical device is being charged upon the output of the comparison result, and select discharging if the electrochemical device is being discharged upon the output of the comparison result (See Fig.1, when threshold value q1 is detected, and while the battery is being charged, charging will be chosen).

As per claim 3, Asao et al. discloses the power system in accordance with claim as discussed above1, further comprising: a comparator that compares the voltage of said electrochemical device with said threshold value; and a remaining capacity detector that calculates a remaining capacity of said electrochemical device based on an output of said comparator (See Fig.21, Items#713 and 704 and Col.21, lines 7-59 , disclose a controller and charge/discharge selector such that when the detected battery voltage exceeds the threshold, the battery is discharged and when the detected voltage is less than the threshold, the battery is charged, Also see Col.10, line 62 to Col.11 line 6, discloses the control circuit computes the storage quantity "remaining capacity" based on the voltage value from the voltage detection circuit),

wherein based on an output of said remaining capacity detector, said charge/discharge controller charges said electrochemical device when the remaining capacity is less than the remaining capacity corresponding to said threshold value and discharges said electrochemical device when the remaining capacity is greater than the remaining capacity corresponding to said threshold value (See Col.10, line 62 to Col.11 line 6, and Fig.21, disclose the control circuit

computes the storage quantity "remaining capacity" based on the voltage value from the voltage detection circuit then sends a signal to control charging current/voltage and switches between charging/discharging based on that storage quantity).

As per claim 10, Asao et al. discloses the power system in accordance with claim 2 as discussed above, further comprising: a parameter detector that detects at least one parameter selected from the group consisting of charge/discharge current, temperature and internal impedance of said electrochemical device (See Fig.21, Item#709, discloses a sense resistor for detecting the charge/discharge current); and a field adjustor that adjusts the relation between the voltage of said electrochemical device and said threshold value based on the detected parameter (See Col.21, lines 50-.65 and Col.22, lines 16-23 disclose the charge/discharge current is detected and fed into the controller which uses the accumulated value of the charge/discharge current and time to change the charging current/voltage i.e. relationship between voltage and threshold voltage is changed).;

As per claim 11, Asao et al. discloses the power system in accordance with claim 3 as discussed above, further comprising: a parameter detector that detects at least one parameter selected from the group consisting of charge/discharge current, temperature and internal impedance of said electrochemical device (See Fig.21, Item#709, discloses a sense resistor for detecting the charge/discharge current); and a field adjustor that adjusts the relation between the voltage or remaining capacity of said electrochemical device and said threshold value based on the detected parameter (See Col.21, lines 50-.65 and Col.22, lines 16-23 disclose the

charge/discharge current is detected and fed into the controller which uses the accumulated value of the charge/discharge current and time to determine the storage quantity and based on that the charging current/voltage is changed i.e. relationship between voltage and threshold voltage is changed).

As per claim 12, Asao et al. discloses the power system in accordance with claim 3 as discussed above, wherein said remaining capacity detector resets the remaining capacity of said electrochemical device to a predetermined value corresponding to said threshold value when it determines the voltage of said electrochemical device to be equal to said threshold value (See Col.10, line 62, to Col.11, line 6, discloses the control circuit computes the remaining capacity from the current and voltage value detected and based on the calculated remaining capacity sends a signal to the signal generator to change the value of the charging current or voltage value which in return resets the remaining capacity, also See Col.6, lines 24-28 disclose that a change in charging current/voltage is preferably in response to the reference signal at the inflection point at which the voltage threshold is set).

As per claim 13, Asao et al. discloses the power system in accordance with claim 12 as discussed above, wherein said remaining capacity detector comprises: a step detector that detects, based on the voltage of said electrochemical device, that said electrochemical device has a remaining capacity corresponding to said step (See Col.11, lines 7-29, discloses an arithmetic operation circuit wherein the relation between the cell voltage and against current values are preliminarily provided and the circuit detects the open circuit voltage and the charge voltage and

when the voltage reaches the open circuit voltage or the pre entered storage quantity at the inflection point, a signal is generated to adjust the charging/discharging current); a current integrator that performs current integration near said step (See Col.22, lines 16-23, discloses the controller recognizes the storage quantity by accumulating "integrating" current and time of charge) ; and a corrector that corrects the remaining capacity of said electrochemical device based on a scale of the step that is determined from a current integral near said step (See Col.22, lines 16-23, disclose based on the integrated current values, the values of the charging current/voltage can be changed which in turn changes "corrects" the remaining capacity).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. **Claims 21** are rejected under 35 U.S.C. 102(b) as being anticipated by Asao et al. (US 6,377,030 B1).

As per claim 21, Asao et al. discloses the power system in accordance with claim 1 as discussed above, wherein the threshold value exists at 100% capacity. However ASAO does not disclose the threshold exists in a voltage range corresponding to between 80% and 90% of a remaining capacity.

However it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention disclosed by Asao et al. such that the threshold corresponds to between 80% and 90% of a remaining capacity for the benefit of protecting the battery against over charging.

5. **Claim 6-8** are rejected under 35 U.S.C. 103(a) as being unpatentable over Asao et al. (US 6,377,030 B1) in view of Yamaguchi et al (US 2002/0062183 A1).

As per claim 6, Asao et al. discloses the power system in accordance with claim 1 as discussed above, but does not disclose wherein said charge/discharge controller controls charge/discharge of said electrochemical device such that at least a part of a difference between an amount of power generated by said power generator and an amount of power consumed by said load device is supplied or stored.

Yamaguchi discloses a control system for a hybrid vehicle wherein controller controls charge/discharge of said electrochemical device such that at least a part of a difference between an amount of power generated by said power generator and an amount of power consumed by said load device is supplied or stored (See Par.6).

Asao and Yamaguchi are analogous art since they both deal with battery charging control.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention disclosed by Asao et al. with that of Yamaguchi such that unused power is stored the benefit of providing an efficient power system where unused power is stored for future use (See Yamaguchi et al, Par.6).

As per claim 7, Asao et al. in view of Yamaguchi disclose the power system in accordance with claim 6 as discussed above, wherein said charge/discharge controller further comprises a power difference determining unit that determines a difference between an amount of power generated by said power generator per unit time and an amount of power consumed by said load device per unit time, and based on an output of said power difference determining unit, said charge/discharge controller controls charge/discharge of said electrochemical device while controlling the amount of power generated by said power generator per unit time (See Yamaguchi Par.6, discloses the controller calculates the power needed to be generated by the power source according to the vehicle conditions and also to measure the state of charge of the battery, excess power that is not used by the load is stored in the battery, if there is no excess power i.e. difference between power generated and power consumed is less than or equal zero, the controller will ensure the power generator is producing its maximum output and apply all generated power to the load and also control discharging of the electrochemical device to supply the required additional power to the load).

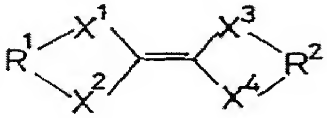
As per claim 8, Asao et al discloses the power system in accordance with claim 1 as discussed above, but does not disclose said electrochemical device is charged by utilizing regenerative energy from said load device.

Yamaguchi et al. discloses the electrochemical device may be charged by utilizing regenerative energy from the load device (See Yamaguchi et al, Par.448).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention disclosed by Asao et al. with that of Yamaguchi to include using regenerative power to charge the electrochemical device, doing so would provide a more efficient power system and reduce amount of fuel used to recharge the battery.

6. **Claim 9** is rejected under 35 U.S.C. 103(a) as being unpatentable over Asao et al. (US 6,377,030 B1) in view of Inatomi et al. (US 2004/0045818 A1).

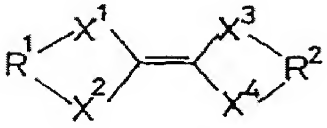
As per claim 9, Asao et al. discloses the power system in claim 1 as discussed above, but does not disclose wherein at least one selected from said positive electrode and said negative electrode comprises a compound having a structure represented by the general formula (1):



where each of RI and R2 is independently a chain or cyclic aliphatic group, R1 and R2 may be the same or different, each of XI to X4 is independently a sulfur atom, an oxygen atom or a tellurium atom, XI to X4 may be the same or different, and said aliphatic group may contain one

or more selected from the group consisting of an oxygen atom, a nitrogen atom, a sulfur atom, a silicon atom, a phosphorus atom and a boron atom

Inatomi et al discloses an electrochemical device comprising at least one selected from said positive electrode and said negative electrode comprises a compound having a structure represented by the general formula



where each of RI and R2 is independently a chain or cyclic aliphatic group, R1 and R2 may be the same or different, each of XI to X4 is independently a sulfur atom, an oxygen atom or a tellurium atom, XI to X4 may be the same or different, and said aliphatic group may contain one or more selected from the group consisting of an oxygen atom, a nitrogen atom, a sulfur atom, a silicon atom, a phosphorus atom and a boron atom (See Inatomi et al Par.38 and 39)

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention disclosed by Asao et al. with that of Inatomi et al. wherein at least one selected from said positive electrode and said negative electrode comprises a compound having a structure represented by the aforementioned formula. Doing so would provide a light weight battery with high energy and high density (See Inatomi, Par.3).

7. **Claims 14-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Asao et al. (US 6,377,030 B1) in view of Kimura et al. (US 2002/0195999 A1).

As per claim 14, Asao et al. discloses the power system in accordance with claim 3 as discussed above, wherein said remaining capacity detector comprises: a step detector that detects, based on the voltage of said electrochemical device, that said electrochemical device has a remaining capacity corresponding to said step (See Col.11, lines 7-29, discloses an arithmetic operation circuit wherein the relation between the cell voltage and against current values are preliminarily provided and the circuit detects the open circuit voltage and the charge voltage and when the voltage reaches the open circuit voltage or the pre entered storage quantity at the inflection point, a signal is generated to adjust the charging/discharging current); and a current integrator that performs current integration near said step (See Col.22, lines 16-23, discloses the controller recognizes the storage quantity by accumulating "integrating" current and time of charge) ; Asao et al. also discloses that when voltage/storage quantity reaches the voltage/storage quantity at the inflection point (threshold value), the charging voltage/current are reset to a different value which in return resets the remaining capacity (See Asao et al. Col.3, lines 4-22 and Col.11, lines 5-28) and the relationship between the cell voltage and capacity (See Fig.10), but does not disclose said remaining capacity detector resets the remaining capacity of said electrochemical device to a predetermined value corresponding to said threshold value when it determines the rate of voltage change relative to capacity change: ΔC obtained by current integration: $\Delta V/\Delta C$ to be equal to $\Delta V/\Delta C$ at the threshold value that has been predetermined depending on charge/discharge current.

Kimura et al. discloses a method for a detecting and resolving memory effect in which he calculates the rate of voltage change relative to capacity change: ΔC obtained by current integration (See Fig.3, step S304, discloses calculating $\Delta V/\Delta SOC$ and step S301 discloses ΔSOC

is calculated by current integration and step S305 compares the calculated $\Delta V/\Delta SOC$ to a predetermined value).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention disclosed by Asao et al. to include the use of rate of change of voltage relative to capacity change disclosed by Kimura et al. Doing so would allow for dynamic battery capacity according to battery condition and while taking into consideration battery memory effect resulting from continuous charging/discharging which would battery memory effect and prolong battery life.

As per claim 15, Asao et al. in view of Kimura et al. disclose the power system in accordance with claim 14 as discussed above, wherein said remaining capacity detector has a corrector that corrects the remaining capacity of said electrochemical device based on a scale of the step that is determined from a current integral near said step (See Col.22, lines 16-23, disclose based on the integrated current values, the values of the charging current/voltage can be changed which in turn changes "corrects" the remaining capacity).

8. **Claims 4-5** are cancelled by the applicant.

Regarding method claims 16-20 and 22, the method steps are met by the operation of Asao et al. as applied to claims 1-15 and 21.

Examiner Notes

Examiner cites particular columns and line numbers in the references as applied to the claims below for the convenience of the applicant. Although the specified citations are representative of the teachings in the art and are applied to the specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested that, in preparing responses, the applicant fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the examiner.

Response to Arguments

Applicant's arguments filed 03/03/2009 have been fully considered but they are not persuasive.

In response to applicant's argument that Asao discloses an apparatus for charging the secondary battery up to the full charge status beyond the inflection point and that it does not control the charge/discharge until the battery reaches a threshold below the full charge state. The examiner respectfully disagrees as the applicant has indicated in claim 1 that "a voltage corresponding to the inflection point or a point adjacent to the inflection point being set as a threshold voltage", this is interpreted to include any point on the charging curve including the 100% capacity point.

In response to the applicant's argument that Asao does not use the output of the comparator to control the charging/discharging, the examiner respectfully disagrees and refers the applicant to Asao (Fig.21, Item#702, and Col.21, lines 25-39, disclose the voltage from the comparator is sent to the controller which based on the output controls the charging/discharging operation).

Applicant's amendment necessitated the new ground(s) of rejection presented in this office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP §706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A Shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE- MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AHMED OMAR whose telephone number is (571)270-7165. The examiner can normally be reached on Monday-Thursday 06:30-16:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Assouad can be reached on 571-272-2210. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edward Tso/
Primary Examiner, Art Unit 2858